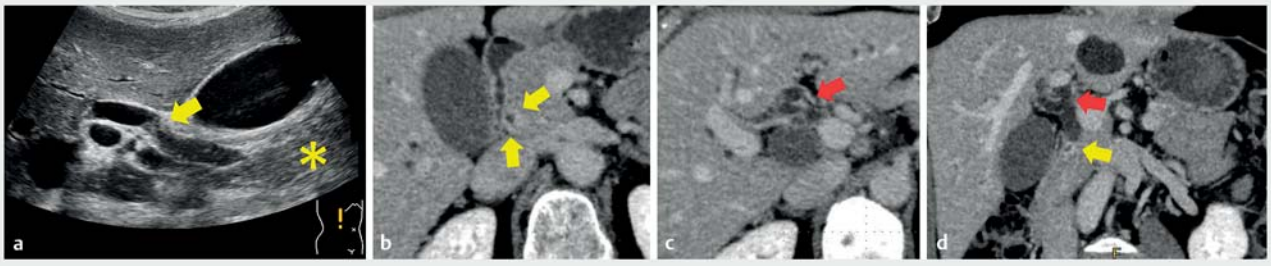
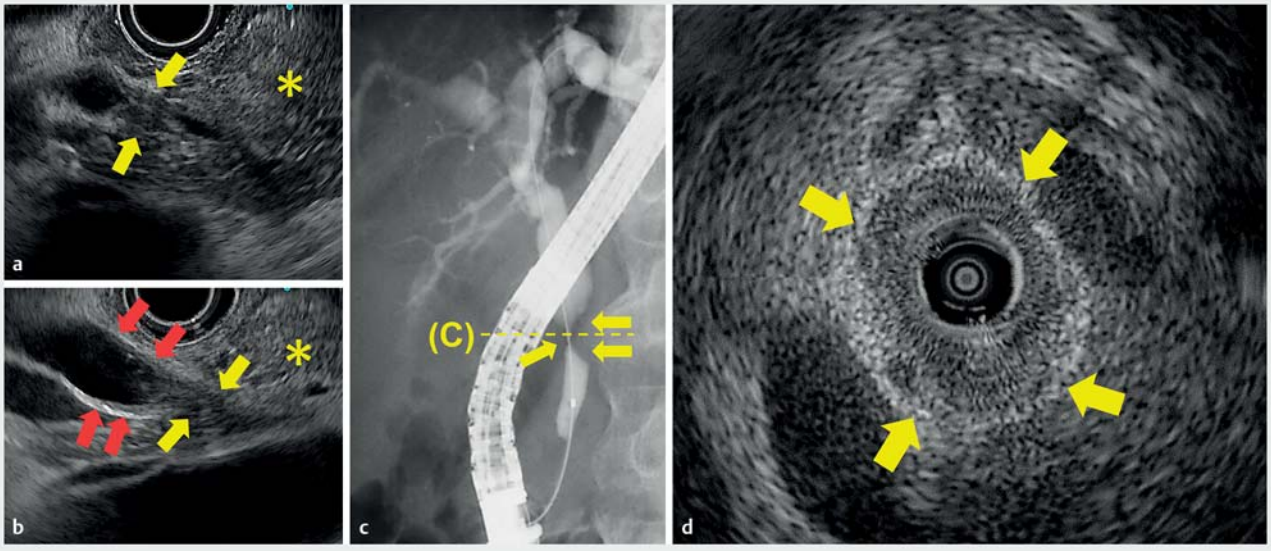
Mapping biopsy for bile duct cancer using a novel device delivery system



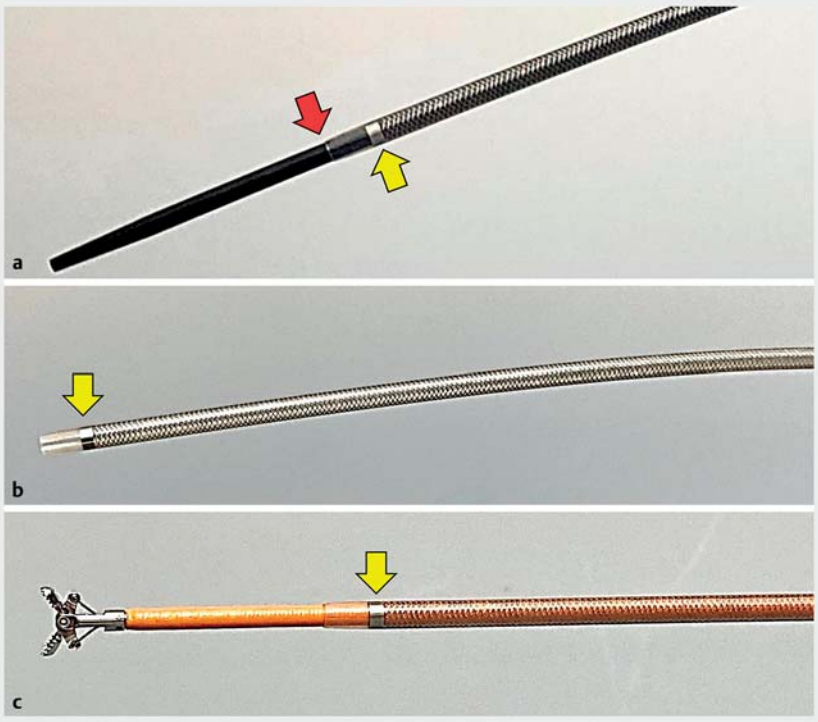
▶ **Fig. 1** Imaging to investigate abnormal liver function tests in a 56-year-old man showing: **a** a distal biliary stricture (yellow arrow) and the pancreatic head (yellow asterisk) on abdominal ultrasound; **b–d** the distal biliary stricture (yellow arrows) and dilated intrahepatic bile ducts, along with the hilar bile duct (red arrows) on computed tomography scanning.



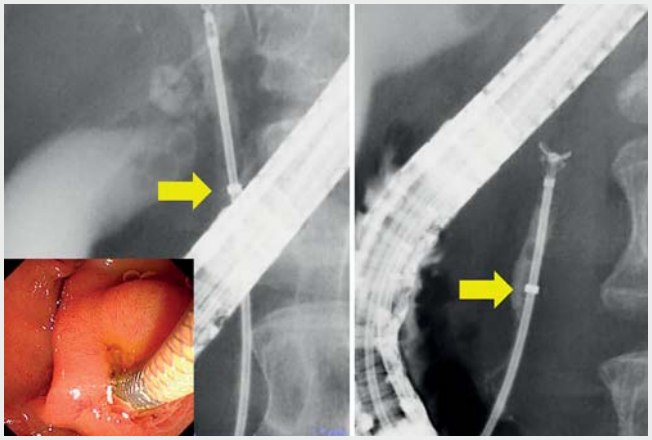
▶ **Fig. 2** Further imaging to investigate the distal biliary stricture showing: **a, b** a distal biliary stricture with wall thickening (yellow arrows) and continuous mild biliary wall thickening (red arrows) in continuity with the main lesion, along with the pancreatic head (yellow asterisk), on endoscopic ultrasound; **c** the distal biliary stricture on endoscopic retrograde cholangiography; **d** circumferential thickening of the biliary wall on an intraductal ultrasound image.

A 56-year-old man presented to our department with abnormal liver function tests. Imaging studies showed a distal biliary stricture with dilated intrahepatic bile ducts (▶ **Fig. 1**). An endoscopic ultrasound (EUS) revealed that there was continuous mild thickening of the wall of the upstream bile duct (▶ **Fig. 2 a, b**). Cholangiocarcinoma was suspected; therefore, an endoscopic retrograde cholangiography (ERC) and an intraductal ultrasound were performed, which showed circumferential thickening of the biliary wall (▶ **Fig. 2 c, d**). Mapping biopsies up to the hilar bile duct and targeted biopsies of the biliary stricture were taken using a novel device delivery system (EndoSheather; Piolax, Japan) (▶ **Fig. 3**; ▶ **Video 1**). As cancer cells were observed in both mapping and targeted biopsy samples (▶ **Fig. 4 a**), additional mapping biopsies were performed on the right and left hepatic ducts (▶ **Fig. 5**), but no malignant cells were detected (▶ **Fig. 4 b**). Based on these imaging and pathological findings, a left hepatopancreatoduodenectomy was performed, and a negative surgical margin was confirmed.

There have been several reports describing the usefulness of mapping biopsies



▶ **Fig. 3** Images of the novel device delivery system showing: **a** the tip of the system with no caliber difference between the inner catheter and outer sheath (red arrow), which has a radiopaque marker at its tip (yellow arrows); **b** the shape of the outer sheath after the inner catheter has been pulled out; **c** the biopsy forceps inserted into the outer sheath.



Video 1 The appearance and functioning of the novel EndoSheather device delivery system, and cholangiography of mapping and targeted biopsies being taken from a bile duct lesion.

to determine an appropriate surgical procedure [1–4]; however, the existing methods have various challenges to overcome. The novel device delivery system that we have developed is composed of a tapered inner catheter and an outer sheath with a 1.9-mm inner diameter, which facilitates passage through the biliary stricture and allows insertion of a conventional biopsy forceps. This device enables multiple biopsies, with a sufficient sample volume, to be taken at various sites, including the peripheral bile ducts. Because the outer sheath serves as a conduit for the biopsy forceps, avoiding repeated and direct contact with the duodenal papilla and the malignant biliary stricture, post-ERC pancreatitis and contamination with cancer cells is prevented. The novel device delivery system is a promising tool to enable mapping biopsies to be taken faster, safely, and more accurately.

Endoscopy_UCTN_Code_TTT_1AR_2AB

Competing interests

The authors declare that they have no conflict of interest.

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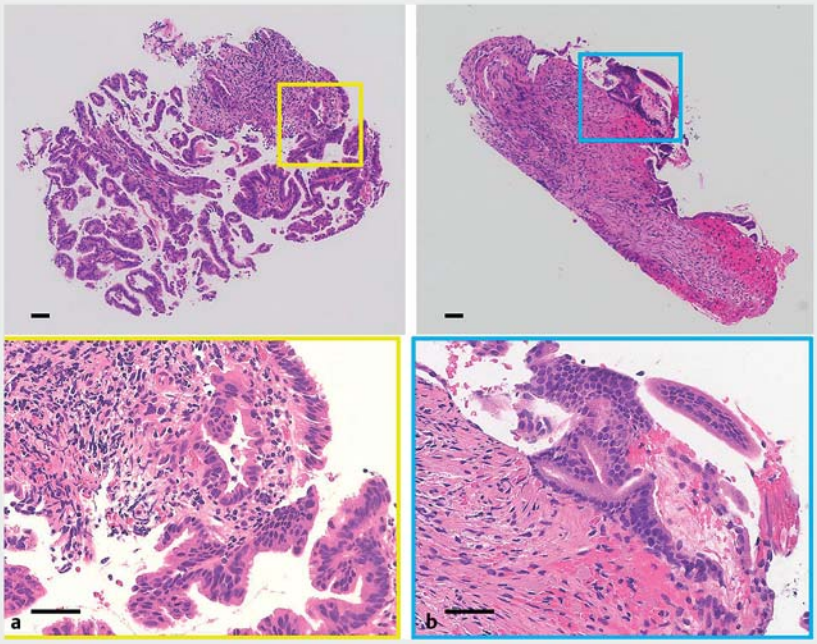
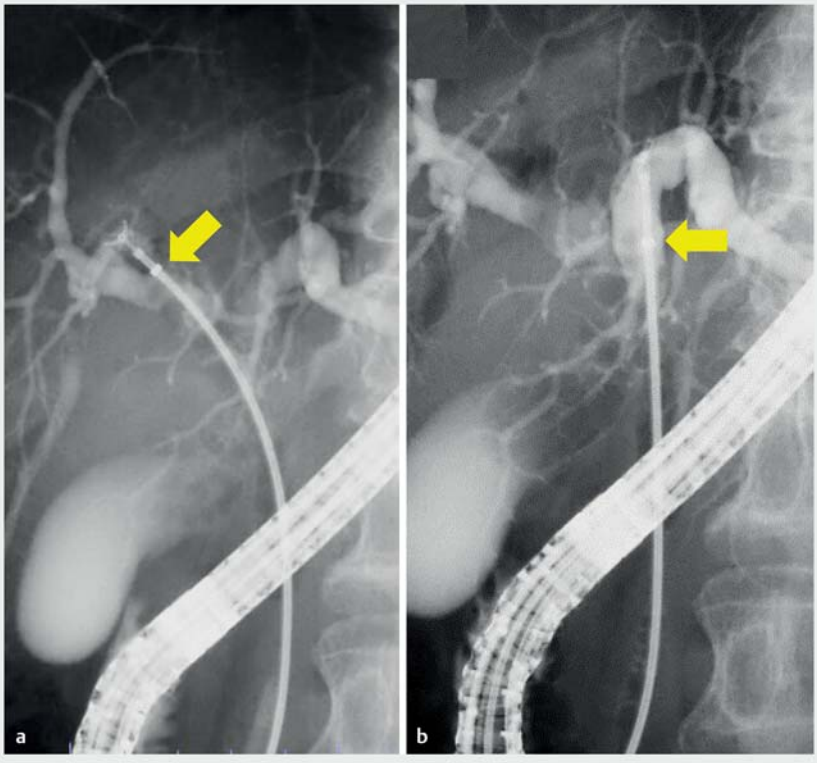


▶ **Fig. 4** Histological appearances of the hematoxylin and eosin (H&E)-stained bile duct specimens (scale bars, 50 µm) obtained from: **a** the hilar bile duct; **b** the right hepatic duct.



▶ **Fig. 5** Images of additional mapping biopsies being taken using the novel device delivery system (yellow arrows indicate the radiopaque marker at the tip of its outer sheath) from: **a** the right hepatic duct; **b** the left hepatic duct.

Bibliography

Endoscopy 2022; 54: E217–E219
DOI 10.1055/a-1479-1969
ISSN 0013-726X
published online 31.5.2021

Georg Thieme Verlag KG, Rüdigerstraße 14,
70469 Stuttgart, Germany